

Vehicle Miles of Travel (VMT)

VMT is calculated by multiplying the amount of daily traffic on a roadway segment by the length of the segment, then summing all the segments' VMT to give you a total for the geographical area of concern. The vehicular traffic amounts are either estimates (current or past data) or they are projections (future data). VMT for this plan is expressed in miles per day.

The Protocol calls for an evaluation of the current long-range transportation plan. By definition the long-range plan covers the geographical area of the MPO, which for the Austin Metropolitan area includes only Hays, Travis and Williamson Counties. The MSA and the region covered by this clean air plan also include Bastrop and Caldwell Counties. Therefore, the analysis of the region's on-road emissions will be of VMT from 3 different sources. Because VMT is an estimate of the amount of vehicular travel in a given geographical area, these estimates and projections are comparable, but not identical.

1. VMT estimates for past years are readily available by county from TxDOT. The VMT from TxDOT is a "typical" daily VMT that can be expected on any given "normal" day, that is, a non-holiday/weekend, no special events occurring, and seasonality removed. VMT projections (future years) must be obtained from another source.
2. The current CAMPO long-range plan, and the update that is underway, has typical VMT estimates and projections for their 3-county region for 1997, 1999, 2007, 2015, 2017, 2025 and 2030.
3. TTI did estimates and projections for the September 1999 ozone episode for the years 1995, 1999, 2002, 2005, 2007, and 2012 in their report, "Austin/San Marcos Metropolitan Statistical Area On-Road Mobile Source Emissions inventories: 1995, 1999, 2002, 2005, 2007, and 2012," dated August 2003.

Emission factors for each year were calculated by CAMPO staff using MOBILE6. Emissions factors are typically expressed in grams/mile. Multiplying the emissions factor times the VMT results in the grams of emissions, either NO_x or VOC. Because the emissions inventory is expressed in tons per day, the resultant grams of on-road emissions were converted to tons by dividing the number of grams by 454 grams/lb and then by 2000 lbs/ton.

After much discussion and testing of various ways to express the reduction of emissions attributable to VMT, staff decided to use EPA's VMT screen as presented in EPA's proposed guidance for transitional areas. EPA's VMT screen uses the following formulas.

2007 VMT Screen (Attainment Year)

$$VMT_{2007} \times \frac{EF_{2007}}{EF_{1999}} \leq VMT_{\text{baseline (1999)}}$$

2015 VMT Screen (Horizon Year)

$$VMT_{2015} \times \frac{EF_{2015}}{EF_{1999}} \leq VMT_{\text{baseline (1999)}}$$

Where,

VMT = Vehicle Miles of Travel

VMT_{baseline (1999)} = VMT estimated for base year (1999)

VMT₂₀₀₇ = VMT projected for 2007

VMT₂₀₁₅ = VMT projected for 2015

EF_{baseline(1999)} = Emission Factor estimated for base year (1999)

EF₂₀₀₇ = Emission Factor projected for 2007

EF₂₀₁₅ = Emission Factor projected for 2015

As long as the product of the future year's VMT and future year's emission factor quotient does not exceed the VMT for the base year, 1999 for this clean air plan, the transportation plan does not intensify the formation of ozone.

The "VMT Screen" for years 2007 and 2015 of the current Capital Area Metropolitan Planning Organization's (CAMPO) long-range transportation plan, *Mobility 2025* gave the following results.

	NOx		VOC	
	3-County		3-County	
	CAMPO LRP		CAMPO LRP	
Year	No Controls	With I&M	No Controls	With I&M
1999	29,002,000		29,002,000	
2007	25,581,815	24,272,679	20,341,594	17,806,098
2015	11,829,175	9,445,901	14,983,609	11,901,044

VMT in the 3-county region is expected to increase 40% from 1999 to 2007 and another 35% from 2007 to 2015. The associated NOx will decrease in the same time so much that it will be as if there will be a 59% decrease in VMT from 1999 to 2007 and a 366% decrease from 1999 to 2015. Slightly more decreases will be realized from the region implementing an inspection and maintenance program in Travis, Williamson and Hays Counties in 2005 (67% and 483%). The expected increases in population and the

planned roadway system that will contribute to an increase in VMT will not contribute to emissions exceeding the amount of emissions that were seen in 1999.

It is not necessary to perform this test for the Transportation Improvement Program (TIP) and TIP amendments, as these, by definition, are incorporated in the long-range transportation plan.

Bastrop and Caldwell Counties are outside the CAMPO boundaries, so their VMT must be obtained from a different source. Also, they will not participate in the I&M program. Therefore, a separate VMT screen, using the same formulas, was conducted for the aggregate 5-county region. Similar results were obtained as realized for the CAMPO area.

	NOx	VOC
	5-County	5-County
	TTI VMT	TTI VMT
Year	No Control Measures	No Control Measures
1999	32,506,000	32,506,000
2007	27,876,311	22,222,919
2015	12,597,286	15,830,018

VMT is expected to increase in the 5-county region by 36% from 1999 to 2007 and 79.3% from 1999 to 2015. Without I&M in the 5-county region, NOX from VMT is expected to decline by 59% from 1999 to 2007 and 362% from 1999 to 2015. Again, the expected increases in population and the planned roadway system which will contribute to an increase in VMT will not contribute to emissions exceeding the amount of on-road emissions that were seen in 1999.

All calculations are shown in Appendix ??.

Another way to evaluate VMT and associated emissions is to directly compare the estimated emissions for future years to the base year emissions. Multiplying the emission factor by the VMT results in an estimate of the daily emissions associated with on-road travel. This evaluation shows a decrease in both NOx and VOC emissions, despite an increase in VMT.

TTI, 5-County, No Controls							
NOx				VOC			
Year	VMT (miles)	EF (g/mi)	VMT X EF (grams)	Year	VMT (miles)	EF (g/mi)	VMT X EF (grams)
1999	32,506,000	1.8920	61,501,352	1999	32,506,000	1.4320	46,548,592
2007	44,508,000	1.1850	52,741,980	2007	44,508,000	0.7150	31,823,220
2015	58,274,000	0.4090	23,834,066	2015	58,274,000	0.3890	22,668,586

Both evaluation techniques, the VMT screen and comparison of emissions, show large enough decreases in on-road emissions to more than offset the anticipated growth in

VMT through 2015. These decreases in emissions will be even greater with the I&M program.

VMT SCREEN FOR THE CONTINUING PLANNING PROCESS

CAPCO and CAMPO staff will analyze air quality and related data and perform necessary modeling updates on an annual basis using the same or similar techniques as used in developing this plan. As new or improved techniques become available, they will be incorporated into the process. The results of these analyses will be reported in the June semi-annual reports beginning in June 2005.

The analyses will evaluate:

1. future transportation patterns;
2. all relevant actual new point sources; and
3. impacts from potential new source growth.

Future Transportation Patterns: As part of the *Mobility 2030* plan development process CAMPO staff will perform the VMT screen for years 2007 and 2017. The screen will test to be sure that any expected increase in VMT over the planning horizons will be offset by technology and control measures, that is, that the expected associated emissions will not exceed the associated emissions of the base year (1999).

As part of this analysis, the emission factors will be reviewed and updated as necessary. Review of the emission factors includes checking and updating the fleet mix.

Future VMT screens will use these or comparable updated formulas.

2007 VMT Screen (Attainment Year)

$$\text{VMT}_{2007} \times \frac{\text{EF}_{2007}}{\text{EF}_{1999}} \leq \text{VMT}_{\text{baseline (1999)}}$$

2017 VMT Screen (Horizon Year)

$$\text{VMT}_{2017} \times \frac{\text{EF}_{2017}}{\text{EF}_{1999}} \leq \text{VMT}_{\text{baseline (1999)}}$$

Where,

VMT = Vehicle Miles of Travel

VMT_{baseline (1999)} = VMT estimated for base year (1999)

VMT_{2007} = VMT estimated for 2007

VMT_{2017} = VMT estimated for 2017

$EF_{\text{baseline}(1999)}$ = Emission Factor estimated for base year (1999)

EF_{2007} = Emission Factor estimated for 2007

EF_{2017} = Emission Factor estimated for 2017

This test will be performed prior to adoption of any CAMPO long-range transportation plan update or amendment that significantly increases VMT.

Appendix for Chapter 6
Statistical Backup

The following tables are copies of the spreadsheets used to make the calculations in Chapter 6, Maintenance for Growth. CAMPO and TxDOT staff developed the spreadsheets in an Excel workbook.

Also included in this appendix are the MOBILE6 output files.

Summary of the VMT Screen

These charts summarize the results of the VMT screen. The VMT screen can be seen as showing **emission reductions** in terms of VMT (vehicle miles of travel).

Actual VMT is expected to increase through 2017.

These calculations assume that the I&M (inspection and maintenance) program starts in 2005/2006.

NOx

	3-County				5-County
	TTI		CAMPO LRP		TTI
	No Controls	I&M	No Controls	I&M	No Controls
1999	29,938,000		29,002,000		32,506,000
2007	20,187,584	19,154,494	19,815,722	18,801,663	21,677,756
2015	8,365,520	6,680,084	9,162,901	7,316,813	9,796,164

VOC

	3-County				5-County
	TTI		CAMPO LRP		TTI
	No Controls	I&M	No Controls	I&M	No Controls
1999	29,938,000		29,002,000		32,506,000
2007	20,796,915	18,204,665	20,413,830	17,869,330	22,332,084
2015	13,728,273	10,903,967	15,036,818	11,943,306	15,907,780

Actual VMT

	CAMPO 3-County	TTI 3-County	TTI 5-County
1999	29,002,000	29,938,000	32,506,000
2007	40,712,000	41,476,000	44,508,000
2015	55,135,000	50,337,000	58,274,000

The emissions from VMT will decline over the years, but could decline a little more and a little sooner if we do I&M (or equivalent measure). Actual VMT will INCREASE while the consequent emissions will decrease.

Percent Reductions

Because VMT actually increases over the years and the results of the VMT screen show emissions reductions in terms of VMT, staff decided that another way to express the reductions may be more appropriate. The first alternate approach is to express the emission reductions in percent change.

The following formula was used to calculate percent change.

$$\text{Percent change in Emissions} = 100 \times (\text{EM}_{2007} - \text{EM}_{1999}) / \text{EM}_{1999}$$

These charts summarize the results of the VMT screen in **percent change** from 1999 to the future years. The VMT screen can be seen as showing **emission reductions** in terms of VMT (vehicle miles of travel).

Actual VMT is expected to increase through 2017.

These calculations assume that the I&M (inspection and maintenance) program starts in 2005/2006.

NOx					
		3-County		5-County	
		No Controls	I&M	No Controls	
1999		0.0%	0.0%	0.0%	
2007		-31.7%	-35.2%	-33.3%	
2015		-68.4%	-74.8%	-69.9%	
		% reduction in emission factors			
				3 County No Controls	3 County I&M
				1999-2007	-53.8%
				1999-2015	-86.7%

VOC					
		3-County		5-County	
		No Controls	I&M	No Controls	
1999		0.0%	0.0%	0.0%	
2007		-29.6%	-38.4%	-31.3%	
2015		-48.2%	-58.8%	-51.1%	
		% reduction in emission factors			
				3 County No Controls	3 County I&M
				1999-2007	-56.1%
				1999-2015	-78.3%

Actual VMT

	CAMPO 3-County		TTI 5-County	
	VMT	% Change	VMT	% Change
1999	29,002,000		32,506,000	
2007	40,712,000	40.4%	44,508,000	36.9%
2015	55,135,000	90.0%	58,274,000	79.3%

The emissions from VMT will decline over the years, but could decline a little more and a little sooner if we do I&M (or equivalent measure). Actual VMT will INCREASE while the consequent emissions will decrease.

Summary VMT X EF (tons)

In order to review the reduction of emissions in a way other than expressed in VMT, staff performed the following calculations:

Emissions = VMT X EF

Where,

VMT = vehicle miles of travel (daily)

EF = the emission factor for either NOx or VOC (grams)

The resultant grams of emissions were converted to tons by dividing by 454 X 2000.

Units = tons

CAMPO, 3-County, No Controls							
NOx				VOC			
Year	Daily VMT	EF	VMT X EF	Year	Daily VMT	EF	VMT X EF
1999	29,002,000	2.4490	78	1999	29,002,000	1.4080	45
2007	40,712,000	1.1920	53	2007	40,712,000	0.7060	32
2015	55,135,000	0.4070	25	2015	55,135,000	0.3840	23

*tons per day

CAMPO, 3-County, I & M							
NOx				VOC			
Year	Daily VMT	EF	VMT X EF	Year	Daily VMT	EF	VMT X EF
1999	29,002,000	2.4490	78	1999	29,002,000	1.4080	45
2007	40,712,000	1.1310	51	2007	40,712,000	0.6180	28
2015	55,135,000	0.3250	20	2015	55,135,000	0.3050	19

*tons per day

TTI, 3-County, No Controls							
NOx				VOC			
Year	Daily VMT	EF	VMT X EF	Year	Daily VMT	EF	VMT X EF
1999	29,938,000	2.4490	81	1999	29,938,000	1.4130	47
2007	41,476,000	1.1920	54	2007	41,476,000	0.7060	32
2015	50,337,000	0.4070	23	2015	50,337,000	0.3840	21

*tons per day

TTI, 3-County, I & M							
NOx				VOC			
Year	Daily VMT	EF	VMT X EF	Year	Daily VMT	EF	VMT X EF
1999	29,938,000	1.8970	63	1999	29,938,000	1.4130	47
2007	41,476,000	1.1310	52	2007	41,476,000	0.6180	28
2015	50,337,000	0.3250	18	2015	50,337,000	0.3050	17

*tons per day

TTI, 5-County, No Controls							
NOx				VOC			
Year	Daily VMT	EF	VMT X EF	Year	Daily VMT	EF	VMT X EF
1999	32,506,000	2.4330	87	1999	32,506,000	1.4250	51
2007	44,508,000	1.1850	58	2007	44,508,000	0.7150	35
2015	58,274,000	0.4090	26	2015	58,274,000	0.3890	25

*tons per day

Increase in VMT per year to equal 1999 emissions

Staff calculated the amount of VMT that theoretically could be added in future years and still not exceed the amount of emissions in the base year (1999). Discussion of this test was not included in the plan because the amounts are so large that they seemed illogical and these increments of increases could not reasonably be expected to be implemented within the region, especially within the time covered by the review (1999 – 2015).

The formula used was to subtract the future year emissions (tons) from the base year emissions and then multiply that times the VMT per ton of emissions.

$$VMT_{\text{additional2007}} = (EM_{1999} - EM_{2007}) \times VMT_{2007}/EM_{2007}$$

Where,

- VMT_{additional2007} = the additional VMT that could be added and not exceed emissions from the base year
- EM₁₉₉₉ = base year emissions
- EM₂₀₀₇ = future year emissions
- VMT₂₀₀₇ = future year VMT

CAMPO, 3-County, No Controls					
NOx			VOC		
Additional Daily VMT to Equal 1999 Emissions		Increase in VMT per Capita	Additional Daily VMT to Equal 1999 Emissions		Increase in VMT per Capita
2007	18,873,485	14.3	2007	17,127,683	13.0
2015	119,375,806	71.0	2015	51,205,667	30.5

CAMPO, 3-County, I&M					
NOx			VOC		
Additional Daily VMT to Equal 1999 Emissions		Increase in VMT per Capita	Additional Daily VMT to Equal 1999 Emissions		Increase in VMT per Capita
2007	22,087,202	16.7	2007	25,363,754	19.2
2015	163,406,225	97.2	2015	78,749,643	46.8

TTI, 3-County, No Controls					
NOx			VOC		
Additional Daily VMT to Equal 1999 Emissions		Increase in VMT per Capita	Additional Daily VMT to Equal 1999 Emissions		Increase in VMT per Capita
2007	20,032,525	15.2	2007	18,442,405	14.0
2015	129,805,904	77.2	2015	59,825,484	35.6

TTI, 3-County, I&M					
NOx			VOC		
Additional Daily VMT to Equal 1999 Emissions		Increase in VMT per Capita	Additional Daily VMT to Equal 1999 Emissions		Increase in VMT per Capita
2007	8,738,311	6.6	2007	26,974,476	20.4
2015	124,408,803	74.0	2015	88,359,374	52.6

TTI, 5-County, No Controls					
NOx			VOC		
Additional Daily VMT to Equal 1999 Emissions		Increase in VMT per Capita	Additional Daily VMT to Equal 1999 Emissions		Increase in VMT per Capita
2007	22,232,167	16.8	2007	20,276,685	15.3
2015	135,092,988	80.4	2015	60,803,249	36.2

Data Input Sheet

To facilitate updates and/or corrections in data and to help manage the Excel workbook, a data input sheet was developed. A change of data on this one spreadsheet is reflected in every appropriate spreadsheet.

3-County, CAMPO, No Controls

Year	VMT	NOx EF	VOC EF
1999	29,002,000	2.4490	1.4080
2007	40,712,000	1.1920	0.7060
2015	55,135,000	0.4070	0.3840

3-County, CAMPO, I & M

Year	VMT	NOx EF	VOC EF
1999	29,002,000	2.4490	1.4080
2007	40,712,000	1.1310	0.6180
2015	55,135,000	0.3250	0.3050

3-County, TTI, No Controls

Year	VMT	NOx EF	VOC EF
1999	29,938,000	1.8970	1.4130
2007	41,476,000	1.1920	0.7060
2015	50,337,000	0.4070	0.3840

3-County, TTI, I & M

Year	VMT	NOx EF	VOC EF
1999	29,938,000	1.8970	1.4130
2007	41,476,000	1.1310	0.6180
2015	50,337,000	0.3250	0.3050

5-County, TTI, No Controls

Year	VMT	NOx EF	VOC EF
1999	32,506,000	2.4330	1.4250
2007	44,508,000	1.1850	0.7150
2015	58,274,000	0.4090	0.3890

Population	Source
1,118,730	*REMI pop. Estimate
1,322,000	CAMPO pop. Estimate
1,681,000	CAMPO pop. Estimate
2,026,000	CAMPO pop. Estimate

MOBILE6 Output Files

CAMPO staff calculated the following MOBILE6 emission factors for use in the VMT screen. The VMT screen uses the composite NOx and VOC rates for “All Vehicles,” but not the CO. The writers have highlighted the emissions factors that were used in the VMT screen.

3-County, 1999, No Controls

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*****
***
* MOBILE6.2 (31-Oct-2002) *
* Input file: C:\M6RUNS\3COEF99.IN (file 2, run 1). *
*****
***
```

M603 Comment:

User has disabled the calculation of REFUELING emissions.

M618 Comment:

User supplied alternate AC input: Sunrise at 7 AM, Sunset at 8 PM.

* Reading Registration Distributions from the following external

* data file: C:\M6RUNS\3COREG.RGD

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

*Diesel Fractions - 2007 (TTI)

M614 Comment:

User supplied diesel sale fractions.

*1999 3-County VMT Mix, weighted by the % VMT by facility for all 3 Counties

*For info, see this spreadsheet: 1999 VMT Data.xls

M615 Comment:

User supplied VMT mix.

M616 Comment:

User has supplied post-1999 sulfur levels.

* #####
 * 1999 3-County Regional Run
 * File 2, Run 1, Scenario 1.
 * #####

Calendar Year: 1999
 Month: July
 Altitude: Low
 Minimum Temperature: 73.6 (F)
 Maximum Temperature: 85.5 (F)
 Absolute Humidity: 100. grains/lb
 Nominal Fuel RVP: 7.6 psi
 Weathered RVP: 7.4 psi
 Fuel Sulfur Content: 300. ppm

Exhaust I/M Program: No
 Evap I/M Program: No
 ATP Program: No
 Reformulated Gas: No

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV
LDDT	HDDV	MC	All Veh			
	GVWR:	<6000	>6000	(All)		
		-----	-----	-----	-----	-----
VMT Distribution:	0.6413	0.2190	0.0463	0.0200	0.0007	0.0007
	0.0710	0.0010	1.0000			

 Composite Emission Factors (g/mi):

Composite VOC :	1.40	1.73	1.22	1.64	1.65	0.74	0.75	0.55
3.79	1.408							
Composite CO :	15.71	21.55	17.10	20.77	25.87	1.63	1.36	2.87
17.06	16.329							
Composite NOX :	1.07	1.23	1.14	1.21	5.29	1.45	1.47	18.80
1.13	2.449							

3-County, 2007, No Controls

* MOBILE6.2 (31-Oct-2002) *
* Input file: C:\M6RUNS\3COEF07.IN (file 2, run 1). *

M603 Comment:
User has disabled the calculation of REFUELING emissions.

M618 Comment:
User supplied alternate AC input: Sunrise at 7 AM, Sunset at 8 PM.

* Reading Registration Distributions from the following external
* data file: C:\M6RUNS\3COREG.RGD

- M 49 Warning:
1.00 MYR sum not = 1. (will normalize)
- M 49 Warning:
1.00 MYR sum not = 1. (will normalize)
- M 49 Warning:
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1.00 MYR sum not = 1. (will normalize)
- M 49 Warning:
1.00 MYR sum not = 1. (will normalize)
- M 49 Warning:
1.00 MYR sum not = 1. (will normalize)

* Reading Hourly VMT distribution from the following external
* data file: C:\M6RUNS\TR07WKD.VHR

*Diesel Fractions - 2007 (TTI)

M614 Comment:
User supplied diesel sale fractions.
*2007 3-County VMT Mix, weighted by the % VMT by facility for all 3 Counties
*For info, see this spreadsheet: 3-Co VMT Data.xls (Updated)

M615 Comment:
User supplied VMT mix.

M616 Comment:
User has supplied post-1999 sulfur levels.

* #####
* 2007 3-County Regional Run
* File 2, Run 1, Scenario 1.
* #####

Calendar Year: 2007
 Month: July
 Altitude: Low
 Minimum Temperature: 73.6 (F)
 Maximum Temperature: 85.5 (F)
 Absolute Humidity: 100. grains/lb
 Nominal Fuel RVP: 7.6 psi
 Weathered RVP: 7.4 psi
 Fuel Sulfur Content: 33. ppm

Exhaust I/M Program: No
 Evap I/M Program: No
 ATP Program: No
 Reformulated Gas: No

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV
LDDT	HDDV	MC	All Veh			
	GVWR:	<6000	>6000	(All)		

VMT Distribution:	0.6283	0.2250	0.0493		0.0207	0.0007	0.0008
	0.0743	0.0010	1.0000				

 Composite Emission Factors (g/mi):

Composite VOC :	0.695	0.840	0.606	0.798	0.858	0.361	0.416
	0.385	3.26	0.706				
Composite CO :	8.92	11.12	8.58	10.67	12.28	1.340	0.832
	16.15	8.949					1.990
Composite NOX :	0.538	0.742	0.731	0.740	2.907	0.823	0.749
	7.926	1.17	1.192				

3-County, 2015, No Controls

 * MOBILE6.2 (31-Oct-2002) *
 * Input file: C:\M6RUNS\3COEF15.IN (file 3, run 1). *

M603 Comment:
 User has disabled the calculation of REFUELING emissions.

M618 Comment:

User supplied alternate AC input: Sunrise at 7 AM, Sunset at 8 PM.

* Reading Registration Distributions from the following external

* data file: C:\M6RUNS\3COREG.RGD

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

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1.00 MYR sum not = 1. (will normalize)

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

* Reading Hourly VMT distribution from the following external

* data file: C:\M6RUNS\TR07WKD.VHR

*Diesel Fractions - 2007 (TTI)

M614 Comment:

User supplied diesel sale fractions.

*2007 3-County VMT Mix, weighted by the % VMT by facility for all 3 Counties

*For info, see this spreadsheet: 3-Co VMT Data.xls (Updated)

M615 Comment:

User supplied VMT mix.

M616 Comment:

User has supplied post-1999 sulfur levels.

* #####

* 2015 3-County Regional Run

* File 3, Run 1, Scenario 1.

* #####

Calendar Year: 2015

Month: July

Altitude: Low

Minimum Temperature: 73.6 (F)

Maximum Temperature: 85.5 (F)

Absolute Humidity: 100. grains/lb

Nominal Fuel RVP: 7.6 psi

Weathered RVP: 7.4 psi

Fuel Sulfur Content: 30. ppm

Exhaust I/M Program: No

Evap I/M Program: No

ATP Program: No
Reformulated Gas: No

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV
LDDT	HDDV	MC	All Veh			
	GVWR:	<6000	>6000	(All)		

VMT Distribution:	0.6283	0.2250	0.0493	0.0207	0.0007	0.0008
0.0743	0.0010	1.0000				

Composite Emission Factors (g/mi):

Composite VOC :	0.363	0.475	0.353	0.453	0.445	0.274	0.241
0.254	3.04	0.384					
Composite CO :	6.20	7.92	6.51	7.67	7.64	1.075	0.622
16.15	6.199						0.360
Composite NOX :	0.256	0.383	0.346	0.376	0.973	0.418	0.280
1.627	1.17	0.407					

3-County, 2007, I&M

* MOBILE6.2 (31-Oct-2002) *
* Input file: C:\M6RUNS\3COIM07.IN (file 5, run 1). *

M603 Comment:

User has disabled the calculation of REFUELING emissions.

M618 Comment:

User supplied alternate AC input: Sunrise at 7 AM, Sunset at 8 PM.

* Reading Registration Distributions from the following external

* data file: C:\M6RUNS\3COREG.RGD

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)
M 49 Warning:
1.00 MYR sum not = 1. (will normalize)
M 49 Warning:
1.00 MYR sum not = 1. (will normalize)

* Reading Hourly VMT distribution from the following external
* data file: C:\M6RUNS\TR07WKD.VHR
* Exhaust I/M program #1 2-Speed/IDLE
* Exhaust I/M program #2 OBD
* Evap I/M program #3 Pressure Test program
* Evap I/M program #4 Pressure Test program
* Diesel Fractions - 2007 (TTI)
M614 Comment:
User supplied diesel sale fractions.
* 2007 3-County VMT Mix, weighted by the % VMT by facility for all 3 Counties
* For info, see this spreadsheet: 3-Co VMT Data.xls (Updated)
M615 Comment:
User supplied VMT mix.
M616 Comment:
User has supplied post-1999 sulfur levels.

* #####
* 2007 3-County Regional Run
* File 5, Run 1, Scenario 1.
* #####
*** I/M credits for Tech1&2 vehicles were read from the following external
data file: TECH12.D

Calendar Year: 2007
Month: July
Altitude: Low
Minimum Temperature: 73.6 (F)
Maximum Temperature: 85.5 (F)
Absolute Humidity: 100. grains/lb
Nominal Fuel RVP: 7.6 psi
Weathered RVP: 7.4 psi
Fuel Sulfur Content: 33. ppm

Exhaust I/M Program: Yes
Evap I/M Program: Yes
ATP Program: No
Reformulated Gas: No

Vehicle Type: LDGV LDGT12 LDGT34 LDGT HDGV LDDV
LDDT HDDV MC All Veh

GVWR:	<6000	>6000	(All)				
VMT Distribution:	0.6283	0.2250	0.0493		0.0207	0.0007	0.0008
	0.0743	0.0010	1.0000				

Composite Emission Factors (g/mi):

Composite VOC :	0.604	0.724	0.523	0.688	0.849	0.361	0.416
	0.385	3.26	0.618				
Composite CO :	7.36	9.13	7.15	8.77	12.01	1.340	0.832
	16.15	7.442					1.990
Composite NOX :	0.479	0.653	0.658	0.654	2.905	0.823	0.749
	7.926	1.17	1.131				

3-County, 2015, I&M

* MOBILE6.2 (31-Oct-2002) *

* Input file: C:\M6RUNS\3COIM15.IN (file 6, run 1). *

M603 Comment:

User has disabled the calculation of REFUELING emissions.

M618 Comment:

User supplied alternate AC input: Sunrise at 7 AM, Sunset at 8 PM.

* Reading Registration Distributions from the following external

* data file: C:\M6RUNS\3COREG.RGD

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

M 49 Warning:

1.00 MYR sum not = 1. (will normalize)

* Reading Hourly VMT distribution from the following external
 * data file: C:\M6RUNS\TR07WKD.VHR
 * Exhaust I/M program #1 2-Speed/IDLE
 * Exhaust I/M program #2 OBD
 * Evap I/M program #3 Pressure Test program
 * Evap I/M program #4 Pressure Test program
 * Diesel Fractions - 2007 (TTI)
 M614 Comment:
 User supplied diesel sale fractions.
 *2007 3-County VMT Mix, weighted by the % VMT by facility for all 3 Counties
 *For info, see this spreadsheet: 3-Co VMT Data.xls (Updated)
 M615 Comment:
 User supplied VMT mix.
 M616 Comment:
 User has supplied post-1999 sulfur levels.

* #####
 * 2015 3-County Regional Run
 * File 6, Run 1, Scenario 1.
 * #####
 *** I/M credits for Tech1&2 vehicles were read from the following external
 data file: TECH12.D

Calendar Year: 2015
 Month: July
 Altitude: Low
 Minimum Temperature: 73.6 (F)
 Maximum Temperature: 85.5 (F)
 Absolute Humidity: 100. grains/lb
 Nominal Fuel RVP: 7.6 psi
 Weathered RVP: 7.4 psi
 Fuel Sulfur Content: 30. ppm

Exhaust I/M Program: Yes
 Evap I/M Program: Yes
 ATP Program: No
 Reformulated Gas: No

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV
LDDT	HDDV	MC	All Veh			
GVWR:	<6000	>6000	(All)			
VMT Distribution:	0.6283	0.2250	0.0493	0.0207	0.0007	0.0008
	0.0743	0.0010	1.0000			

Composite Emission Factors (g/mi):

Composite VOC :	0.283	0.364	0.274	0.348	0.442	0.274	0.241
0.254	3.04	0.305					
Composite CO :	4.64	5.87	5.04	5.72	7.60	1.075	0.622
16.15	4.684						0.360
Composite NOX :	0.174	0.266	0.263	0.266	0.973	0.418	0.280
1.627	1.17	0.325					

5-County, 1999, No Controls

```
*****
***
* MOBILE6.2 (31-Oct-2002) *
* Input file: C:\M6RUNS\5COEF99.IN (file 1, run 1). *
*****
```

M603 Comment:
User has disabled the calculation of REFUELING emissions.

M618 Comment:
User supplied alternate AC input: Sunrise at 7 AM, Sunset at 8 PM.

```
* Reading Registration Distributions from the following external
* data file: C:\M6RUNS\5COREG.RGD
*Diesel Fractions - 2007 (TTI)
```

M614 Comment:
User supplied diesel sale fractions.

```
*1999 5-County VMT Mix, weighted by the % VMT by facility for all 5 Counties
*For info, see this spreadsheet: 1999 VMT Data.xls
```

M615 Comment:
User supplied VMT mix.

M616 Comment:
User has supplied post-1999 sulfur levels.

```
* #####
```

```
* 1999 5-County Regional Run
```

```
* File 1, Run 1, Scenario 1.
```

```
* #####
```

Calendar Year: 1999
Month: July
Altitude: Low
Minimum Temperature: 73.6 (F)
Maximum Temperature: 85.5 (F)

Absolute Humidity: 100. grains/lb
 Nominal Fuel RVP: 7.6 psi
 Weathered RVP: 7.4 psi
 Fuel Sulfur Content: 300. ppm

Exhaust I/M Program: No
 Evap I/M Program: No
 ATP Program: No
 Reformulated Gas: No

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV
LDDT	HDDV	MC	All Veh			
GVWR:	<6000	>6000	(All)			
VMT Distribution:	0.6413	0.2190	0.0463	0.0195	0.0007	0.0007
	0.0715	0.0010	1.0000			

Composite Emission Factors (g/mi):

Composite VOC :	1.42	1.74	1.23	1.65	1.77	0.75	0.76	0.54
	3.83	1.425						
Composite CO :	15.87	21.70	17.22	20.92	27.94	1.64	1.38	2.83
	17.13	16.496						
Composite NOX :	1.07	1.23	1.14	1.22	5.62	1.46	1.48	18.29
	1.13	2.433						

5-County, 2007, No Controls

 * MOBILE6.2 (31-Oct-2002) *
 * Input file: C:\M6RUNS\5COEF07.IN (file 9, run 1). *

M603 Comment:
 User has disabled the calculation of REFUELING emissions.

M618 Comment:
 User supplied alternate AC input: Sunrise at 7 AM, Sunset at 8 PM.

* Reading Registration Distributions from the following external
 * data file: C:\M6RUNS\5COREG.RGD
 *Diesel Fractions - 2007 (TTI)

M614 Comment:

User supplied diesel sale fractions.

*2007 5-County VMT Mix, weighted by the % Total VMT for all 5 Counties

*For info, see this spreadsheet: 2007 5-Co VMT Data.xls (Updated)

M615 Comment:

User supplied VMT mix.

M616 Comment:

User has supplied post-1999 sulfur levels.

* #####
* 2007 5-County Regional Run
* File 9, Run 1, Scenario 1.
* #####

Calendar Year: 2007
Month: July
Altitude: Low
Minimum Temperature: 73.6 (F)
Maximum Temperature: 85.5 (F)
Absolute Humidity: 100. grains/lb
Nominal Fuel RVP: 7.6 psi
Weathered RVP: 7.4 psi
Fuel Sulfur Content: 33. ppm

Exhaust I/M Program: No
Evap I/M Program: No
ATP Program: No
Reformulated Gas: No

Vehicle Type: LDGV LDGT12 LDGT34 LDGT HDGV LDDV
LDDT HDDV MC All Veh
GVWR: <6000 >6000 (All)

VMT Distribution: 0.6283 0.2260 0.0493 0.0201 0.0007 0.0008
0.0739 0.0010 1.0000

Composite Emission Factors (g/mi):
Composite VOC : 0.705 0.848 0.612 0.806 0.922 0.367 0.422
0.377 3.28 0.715
Composite CO : 8.98 11.18 8.66 10.73 13.27 1.349 0.841 1.957
16.15 9.022
Composite NOX : 0.543 0.745 0.740 0.744 3.125 0.836 0.759
7.767 1.17 1.185

5-County, 2015, No Controls

* MOBILE6.2 (31-Oct-2002) *
* Input file: C:\M6RUNS\5COEF15.IN (file 10, run 1). *

M603 Comment:
User has disabled the calculation of REFUELING emissions.

M618 Comment:
User supplied alternate AC input: Sunrise at 7 AM, Sunset at 8 PM.

* Reading Registration Distributions from the following external
* data file: C:\M6RUNS\5COREG.RGD
* Diesel Fractions - 2007 (TTI)
M614 Comment:
User supplied diesel sale fractions.
* 2007 5-County VMT Mix, weighted by the % Total VMT for all 5 Counties
* For info, see this spreadsheet: 2007 5-Co VMT Data.xls (Updated)

M615 Comment:
User supplied VMT mix.

M616 Comment:
User has supplied post-1999 sulfur levels.

* #####
* 2015 5-County Regional Run
* File 10, Run 1, Scenario 1.
* #####

Calendar Year: 2015
Month: July
Altitude: Low
Minimum Temperature: 73.6 (F)
Maximum Temperature: 85.5 (F)
Absolute Humidity: 100. grains/lb
Nominal Fuel RVP: 7.6 psi
Weathered RVP: 7.4 psi
Fuel Sulfur Content: 30. ppm

Exhaust I/M Program: No
Evap I/M Program: No
ATP Program: No
Reformulated Gas: No

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV
LDDT	HDDV	MC	All Veh			
GVWR:		<6000	>6000	(All)		

VMT Distribution:	0.6283	0.2260	0.0493		0.0201	0.0007	0.0008
	0.0739	0.0010	1.0000				

 Composite Emission Factors (g/mi):

Composite VOC :	0.369	0.480	0.357	0.458	0.475	0.281	0.245
0.248	3.06	0.389					
Composite CO :	6.25	7.96	6.56	7.71	8.34	1.086	0.629
16.15	6.257						0.357
Composite NOX :	0.260	0.386	0.349	0.379	1.039	0.429	0.285
1.614	1.17	0.409					

The following tables are the VMT screens. Each title includes the targeted precursor, the area covered, source of VMT, and any additional local control measures included in the emissions factor. For example, “**NO_x, 5-county, TTI VMT, No controls**” means that the emission factors are for NO_x, the entire 5-county MSA is covered, the VMT is from the TTI report on the September episode, and there were no additional local control measures included in the MOBILE6 input files.

NOx, 3-County, TxDOT & CAMPO VMT, No Controls

NOx

Emission Factors	
1999	2.4490
2007	1.1920
2015	0.4070

		1999 VMT =	29,002,000
	Is the 1999 VMT greater than or equal to the VMT for the future year?	Yes/No	
2007	$VMT_{1999} \geq EF_{2007}/EF_{1999} \times VMT_{2007}$	YES	19,815,722.34
2015	$VMT_{1999} \geq EF_{2015}/EF_{1999} \times VMT_{2015}$	YES	9,162,901.18

2025 Plan VMT	
1999	29,002,000
2007	40,712,000
2015	55,135,000

* HPMS 1999 VMT

VOC, 3-County, TxDOT & CAMPO VMT, No Controls

VOC

Emission Factors	
1999	1.4080
2007	0.7060
2015	0.3840

		1999 VMT =	29,002,000
	Is the 1999 VMT greater than or equal to the VMT for the future year?	Yes/No	
2007	$VMT_{1999} \geq EF_{2007}/EF_{1999} \times VMT_{2007}$	YES	20,413,829.55
2015	$VMT_{1999} \geq EF_{2015}/EF_{1999} \times VMT_{2015}$	YES	15,036,818.18

2025 Plan VMT	
1999	29,002,000
2007	40,712,000
2015	55,135,000

* HPMS 1999 VMT

NOx, 3-County, TxDOT & CAMPO VMT, I&M

NOx

Emission Factors	
1999	2.4490
2007	1.1310
2015	0.3250

		1999 VMT =	29,002,000
	Is the 1999 VMT greater than or equal to the VMT for the future year?	Yes/No	
2007	$VMT_{1999} \geq EF_{2007}/EF_{1999} \times VMT_{2007}$	YES	18,801,662.72
2015	$VMT_{1999} \geq EF_{2015}/EF_{1999} \times VMT_{2015}$	YES	7,316,812.98

2025 Plan VMT	
1999	29,002,000
2007	40,712,000
2015	55,135,000

* HPMS 1999 VMT

VOC, 3-County, TxDOT & CAMPO VMT, I&M

VOC

Emission Factors	
1999	1.4080
2007	0.6180
2015	0.3050

		1999 VMT =	29,002,000
	Is the 1999 VMT greater than or equal to the VMT for the future year?	Yes/No	
2007	$VMT_{1999} \geq EF_{2007}/EF_{1999} \times VMT_{2007}$	YES	17,869,329.55
2015	$VMT_{1999} \geq EF_{2015}/EF_{1999} \times VMT_{2015}$	YES	11,943,306.11

2025 Plan VMT	
1999	29,002,000
2007	40,712,000
2015	55,135,000

* HPMS 1999 VMT

NOx, 5-county, TTI VMT, No controls

NOx

Emission Factors	
1999	2.4330
2007	1.1850
2015	0.4090

VMT Screen

		1999 VMT =	32,506,000
	Is the 1999 VMT greater than or equal to the VMT for the future year?	Yes/No	
2007	$VMT_{1999} \geq EF_{2007}/EF_{1999} \times VMT_{2007}$	YES	21,677,755.86
2015	$VMT_{1999} \geq EF_{2015}/EF_{1999} \times VMT_{2015}$	YES	9,796,163.58

TTI VMT	
1999	32,506,000
2007	44,508,000
2015	58,274,000

* TTI VMT Sept. 20, 1999 episode

VOC, 5-County, TTI VMT, No Controls

VOC

Emission Factors	
1999	1.4250
2007	0.7150
2015	0.3890

		1999 VMT =	32,506,000
	Is the 1999 VMT greater than or equal to the VMT for the future year?	Yes/No	
2007	$VMT_{1999} \geq EF_{2007}/EF_{1999} \times VMT_{2007}$	YES	22,332,084.21
2015	$VMT_{1999} \geq EF_{2015}/EF_{1999} \times VMT_{2015}$	YES	15,907,779.65

TTI VMT	
1999	32,506,000
2007	44,508,000
2015	58,274,000

* TTI VMT Sept. 20, 1999 episode